

Application # 09/758,573
Submitted December 14, 2007
Reply to Office Action of June 14, 2007

III. REMARKS/ARGUMENTS

4. The Office Action dated June 14, 2007 has been carefully considered.

Reconsideration of this application, in view of the following remarks, is respectfully requested.

A. References

5. The following U.S. patents were relied upon in the office action:

- US Patent 5,684,968 ("Flurry"), filed June 16, 1995
- US Patent 5,696,940 ("Liu"), filed September 29, 1995
- US Patent 6,338,119 ("Anderson"), filed March 31, 1999
- US Patent 6,592,629 ("Cullen"), filed November 13, 1997

B. Overview of Office Action

6. The office action:

a. rejected claims 1, 5-9, 11-23, 25-27, and 29-33 as being unpatentable over Liu (U.S. 5,696,940) in view of Flurry (U.S. 5,684,968) under 35 U.S.C. 103(a),

b. rejected claims 2-4 as being unpatentable over Liu in view of Flurry as applied to claim one above, and in further view of Anderson (U.S. 6,338,119) under 35 U.S.C. 103(a),

c. rejected claims 24, and 28, as being unpatentable over Liu in view of Flurry and in further view of Cullen (U.S. 6,592,629) under 35 U.S.C. 103(a),

d. was made final, stating "Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action."

IV. REQUEST FOR WITHDRAWAL OF FINAL STATUS

7. The office action was made final stating "Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action." However as stated in March 27,

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2007, Reply the amended only clarified the claim language regarding the specific definition of memory as "main memory" which had already been made in the February 16, 2005, Reply. In particular in the February 16, 2005, Reply, Applicant provided a special definition for memory.

| | |
|--------|---|
| memory | <i>main memory</i> which is distinct from an I/O RAM, a CPU cache, or an external cache |
|--------|---|

8. Thus, the March 27, 2007, claim amendments did not change the scope of the claims from their previous scope. Further, the Applicant previously submitted that "these changes by themselves do not require a new search, nor would they impose a burden on the examiner." Accordingly, Applicant submits that the March 27, 2007, amendments did not necessitate the new ground(s) of rejection. Applicant respectfully submits that the FINAL disposition be reversed.

V. CLAIM ELEMENTS NOT ADDRESSED

9. The office action failed to specifically identify where the proposed combinations teach or suggest elements of certain dependent claims. The following table shows the claims and claim language not addressed.

| Claim | Limitation(s) |
|----------|---|
| Claim 6 | wherein said <u>copying</u> is accomplished by calling a <u>memory copy function</u> |
| Claim 7 | wherein said <u>image data</u> is copied in a single call to <u>said memory copy function</u> |
| Claim 8 | wherein a subset of said <u>image data</u> is copied one line at a time by repeated calls to <u>said memory copy function</u> |
| Claim 9 | wherein a subset of said <u>image data</u> is copied by repeated calls to <u>said memory copy function</u> |
| Claim 12 | <u>increasing image processing performance</u> |
| Claim 16 | whereby <u>image processing time</u> is reduced |
| Claim 21 | <u>network of machines</u> ...first machines which implement claim 1...second machines which implement claim 12... <u>whereby a video signal is digitized and encoded by at least one of said first machines, transmitted across said network to other of said second machines that decode and output the results</u> |
| Claim 22 | whereby <u>image processing time</u> is reduced compared to the <u>image processing time</u> required if the processor processed the first copy of the <u>image data</u> in the <u>input</u> |

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| | |
|----------|---|
| | device |
| Claim 26 | <u>whereby image processing time is reduced compared to the image processing time required if the processor generated the image data directly in said output device instead of said main memory</u> |

10. Applicant submits that claims 6, 7, 8, 9, 12, 16, 21, 22, and 26 and any claims dependent on these claims are patentable as previously submitted. As shown in the table above each claim limiting language that was not clearly addressed by the office action and which are not taught or suggested by the prior art of record. See previous responses regarding these distinctions. See also the discussion below regarding the new reference Flurry.

VI. CLAIM AMENDMENTS

11. Claim 1 has been amended to add distinguishing language similar to that found in claims 16, 22, and 26. Applicant submits that claim 1 as amended and any claims dependent on claim 1 should now be in condition for allowance.

12. This amendment to claim 1 clarifies the existing language in the preamble regarding "increasing image processing performance" and thus was not made to overcome prior art.

VII. DISTINCTION OVER PRIOR ART

C. Novel, Unrecognized Result: Faster Image Processing

13. The Title of this invention is "Faster Image Processing."

14. The Summary of Invention is "methods of increasing performance of image processing by copying image data between I/O memory and main memory where CPU intensive processing of the image data is more efficiently performed.

15. The stated objects of the invention, page 3, include:
"(a) to provide efficient processing of image data prior to display on a computer display.

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(b) to provide efficient processing of image data being captured in real time with a video digitizer.

(c) to reduce the time necessary to process the image data.”

16. The discovered improvement and unexpected result is summarized at least in the “Processing Speed Improvement” second on page 6 of the specification, “When video data is being displayed or captured the storage (memory 103 or I/O RAM 220) holding the data is continually being accessed by the video display circuitry or video digitizing circuitry. Also the capture video RAM 113 and the display video RAM 120 typically is not cached by a CPU 101 in any cache (230 or 240), so when processing the video data for compression, encryption, enhancement, or decompression it is significantly faster to process the data in cacheable main memory.” Further, page 7, states, “This invention discovered that is was much more efficient to write the decoded data to a [main] memory buffer 300 instead of writing it directly to image 310 in I/O RAM 220 as each pixel is processed.”

17. Further, in the “Not Obvious” section on page 7, the specification explains, “The speed improvement yielded by this invention was not obvious to one skilled in the art of computer programming. The video data is large, up to 1.2 million bytes, and the time to copy it from one buffer to another generally is thought to be overhead that will decrease performance. This invention teaches that because of hardware lockout, collisions with the video circuitry, or the lack of data caching in the CPU cache 240 or memory cache 230, the extra copy can significantly reduce the processing time, and thus reduce the overall time required to process the data and to display or capture the video data.”

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18. Making an extra second copy of the data would have been considered to be overhead and adverse to performance.

D. Distinction Already Claimed

19. Each of the independent claims as *previously* written include claim language that require this aspect of the invention, which is not disclosed in the cited prior art (see table in prior response and table above).

20. special definition provided over two years ago on February 16, 2005. Further, applicant submits that these changes by themselves do not require a new search, nor would they impose a burden on the examiner.

21. Accordingly the new special definition for "main memory" is rewritten as follows:

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|-------------|---|
| main memory | a memory which is distinct from an I/O RAM, a CPU cache, or an external cache |
|-------------|---|

E. Conventional Structural Elements

22. The Office Action relies on combinations of Liu, Flurry, Anderson, and Cullen to provide teaching regarding many of the structural elements of the claimed methods, such I/O RAM, main memory buffers, CPU, cached memory, CPU caches, external caches, DMA circuitry, etc. Many of these structural elements were well known in the art (as discussed in the Background—Related Technology section of the specification and in reference to Figures 1A, 1B, 1C, 2A and 2B).

F. Novel Functionality and New Use of Convention Structure

23. The present invention claims novel methods and uses of convention structures for in order to achieve an unrealized result. In particular, image processing performance may be

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increased by explicitly copying a an image existing in an I/O RAM into an extra second copy of said image in a buffer in main memory prior to performing CPU intensive operations on the data copied from said image.

24. Aspects of the present invention are further described in reference to Figures 4, 5, and 6.

G. Previous Prior Art and New Grounds: Flurry

25. In the previous office actions and responses the teachings of Liu, Anderson, and Cullen have all be discussed and their teaching alone or in various combinations fail to teach the novel aspects of the present invention. Applicant's earlier discussions regarding those prior art references are included herein by reference. The present office action adds Flurry to attempt to provide the missing teaching. However, Flurry alone or in various combinations still fails to teach the present invention as claimed.

H. Overview of Flurry

26. Flurry is directed to a multiprocessing system whereby multiple applications (360 and 362) are provided access via a device driver 370 to image data being captured or displayed on a shared graphics/video adapter 200. The Flurry invention allows multiple frames to be displayed in multiple windows, specifically describing a device driver that allows the sharing of the video graphics adapter. The underlying purpose for copying the image data from the I/O RAM (i.e. Frame Buffer VRAM 240) is so that each of the sharing application can work on the image data while releasing the shared resource.

27. While Flurry teaches some of the elements of the present claims, it fails to teach or suggest the claimed purpose and result. Further, Flurry is limited to a multiprocessing system

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where multiple application share the same graphic/video adapter. Applicant's invention is not so limited. For example, it can be used in a standalone, dedicated image processing system and still provide results unanticipated by Flurry (or its proposed combination with Liu).

VIII. CLAIM ELEMENTS WHICH DISTINGUISH OVER THE PRIOR ART NOT CLEARLY IDENTIFIED WITH CONVINCING REASONING

28. Each of the independent claims as amended contain language which distinctly claim the invention with language which distinguish the novel functionality and benefits of the present invention over the structural elements identified in the prior art combinations cited by the office action. As discussed in the following sections, the office action has not identified where these novel features are taught or suggested by the cited prior art.

Claim 1

29. Claim 1 claims a "method of increasing image processing performance by explicitly copying a first instance of an image existing in an I/O RAM into an extra second copy of said image in a buffer in main memory prior to performing CPU intensive operations on the data copied from said image, wherein the CPU access is made directly to the extra second copy of the data in main memory and not to the first instance in said I/O RAM." (emphasis added).

30. Further the office action does not show where the prior art clearly teaches the discovery that taking the time and resources to make "an extra second copy" leads to the result of "increasing image procession performance" over convention methods. Thus the office action has not shown where subject matter of claim 1 as a whole, including its differences over the prior art, would have been obvious.

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Claim 12

31. Claim 12 claims a “method of increasing image processing performance by explicitly storing the processed results of CPU intensive operations in a first instance of a buffer in main memory prior to copying the processed data into a distinct second copy of the processed data in an image in an I/O RAM, wherein the CPU results are written directly to the first instance of the processed data in main memory and not to the distinct second copy in said I/O RAM.” (emphasis added).

32. The office action does not show where the prior art clearly teaches the discovery that taking the time and resources to make “a distinct second copy” leads to the result of “increasing image processing performance” over convention methods. Thus the office action has not shown where subject matter of claim 12 as a whole, including its differences over the prior art, would have been obvious.

Claim 16

33. Claim 16 claims a “machine for image processing...wherein said image data is copied from said I/O device to a second copy of said image data in a buffer in said main memory prior to being processed by said processor or wherein said processor processes said image data using a buffer in said main memory before copying the processed image data from said main memory to said I/O device, whereby image processing time is reduced.” (emphasis added).

34. The office action does not show where the prior art clearly teaches the discovery that taking the time and resources to make “a second copy” leads to the result where “image processing time is reduced” over convention methods. Thus the office action has not shown

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where subject matter of claim 16 as a whole, including its differences over the prior art, would have been obvious.

Claim 22

35. Claim 22 claims a "machine for image processing..." which includes "a means for copying said image data from said input device to a second copy of said image data in a buffer in said main memory prior to being processed by said processor, whereby image processing time is reduced compared to the image processing time required if the processor processed the first copy of the image data in the input device." (emphasis added).

36. The office action does not show where the prior art clearly teaches the discovery that taking the time and resources to make "a second copy" leads to the result where "image processing time is reduced compared to the image processing time required if the processor processed the first copy of the image data in the input device." Thus the office action has not shown where subject matter of claim 22 as a whole, including its differences over the prior art, would have been obvious.

Claim 26

37. Claim 26 claims a "machine for image processing" including "a means for copying, after said processor generates a first set of image data in said main memory, said first set of image data from said main memory to a second copy of said image data in said output device, whereby image processing time is reduced compared to the image processing time required if the processor generated the image data directly in said input device instead of said main memory." (emphasis added).

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38. The office action does not show where the prior art clearly teaches the discovery that taking the time and resources to make "a second copy" leads to the result where "image processing time is reduced compared to the image processing time required if the processor processed the first copy of the image data in the input device." Thus the office action has not shown where subject matter of claim 26 as a whole, including its differences over the prior art,

Dependent Claims At Least Allowable

39. Applicant submits that the independent claims may all be distinguished over the cited prior art as discussed above. Further all of the dependent claims would be allowable for at least the same reasons that the claims upon which they depend are allowable. Further, at least some of the dependent claims included novel features, such as discussed above regarding specific claims, and various ways in which the memcpy function is used which results in further improvements to the image processing performance than was unexpected by the prior art (in particular claims 7-9.

Reconsideration Requested

40. The undersigned respectfully submits that, in view of the foregoing remarks, the rejections of the claims raised in the Office Action have been fully addressed and overcome, and the present application is believed to be in condition for allowance. It is respectfully requested that this application be reconsidered, that these claims be allowed, and that this case be passed to issue. If it is believed that a telephone conversation would expedite the prosecution of the present application, or clarify matters with regard to its allowance, the Examiner is invited to call the undersigned inventor at 408-739-9517.

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Respectfully submitted,



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